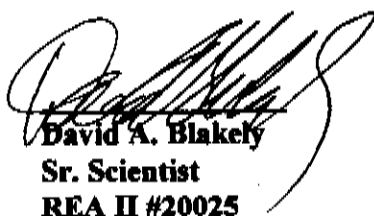


# SOIL GAS SURVEY WORK PLAN

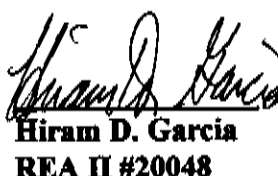
FOR

**ANGELES CHEMICAL COMPANY  
8915 SORENSEN AVENUE  
SANTA FE SPRINGS, CALIFORNIA**

Prepared by:  
**Blakely Environmental Investigations, Inc.  
P.O. Box 339  
Wrightwood, CA 92397  
(760)-249-5498**

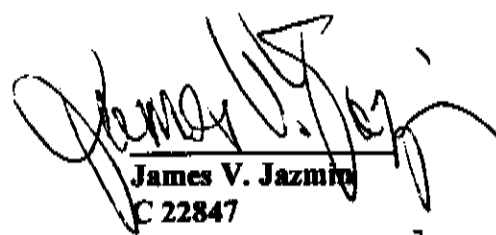
  
**David A. Blakely  
Sr. Scientist  
REA II #20025**



  
**Hiram D. Garcia  
REA II #20048**



October 5, 2000

  
**James V. Jazmin  
C 22847**



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## **1.0) INTRODUCTION**

Blakely Environmental Investigations, Inc. (BEII) was contracted by Angeles Chemical Company, Inc. ((562) 945-3911) to prepare a soil gas survey work plan in order to determine the lateral extent of volatile organic compound (VOC) soil vapors in the vadose zone beneath their facility located at 8915 Sorensen Avenue, Santa Fe Springs, California (See Figure 1, Site Location Map). The work plan details the proposed work as requested by the regulatory lead agency, the Department of Toxics Substance Control (DTSC), in a meeting held at the Glendale offices on June 2, 2000.

## **2.0) SITE LOCATION AND HISTORY**

The site is approximately 1.8 acres in size and completely fenced. The site was bound to Sorensen Avenue on the east, Liquid Air Corporation to the northwest, Plastall Metals Corporation to the north, and a Southern Pacific Railroad easement and Mckesson Chemical Company to the south.

The property was owned by Southern Pacific Transportation Company and was not developed until 1976.

The Angeles Chemical Company has operated as a chemical repackaging facility since 1976. A total of thirty-four underground storage tanks (USTs) are presently at the site with one additional UST used as a containment for surface runoff or spillage. Chemicals which have been stored and used on site include, but are not limited to, acetone, methylene chloride, 1,1,1-trichloroethane (1,1,1-TCA), tetrachloroethene (PCE), methyl ethyl ketone (MEK), toluene, xylene, kerosene, diesel, and unleaded gasoline.

In January 1990, SCS conducted a site investigation. SCS advanced eight borings from 5' below grade (bg) to 50' bg. Soil samples collected and analyzed identified benzene, 1,1-Dichloroethane (1,1-DCA), 1,1-Dichloroethene (1,1-DCE), MEK, methyl isobutyl ketone (MIBK), toluene, 1,1,1-TCA, PCE, and xylenes at detectable concentrations.

In June 1990, SCS performed an additional site investigation at the site by advancing six additional borings advanced from 20.5' bg to 60' bg. A monitoring well (MW-1) was also installed. Soil sample analysis identified detectable concentrations of the above mentioned VOCs in addition to acetone and methylene chloride. Dissolved benzene, 1,1-DCA, 1,1-DCE, PCE, TCE, and trans-1,2-dichloroethene were detected in MW-1 above allowable levels.

Between 1993 and 1994, SCS performed further testing at the site. Soil samples were collected from nine borings. Five borings were converted to groundwater wells MW-2 through MW-6 (See Figure 2, SCS Well Location Map). The predominant compounds detected in soil were acetone, MEK, MIBK, PCE, toluene, 1,1,1-TCA, TCE, and xylenes. Groundwater sample

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collection and analysis identified the following using EPA method 624:

Component Analyzed	MW-1	MW-2	MW-3	MW-4	MW-6	MW-7
<b>Benzene</b>	194	<100	63	111	795	46
<b>1,1-DCA</b>	649	1,130	85	1,410	2,260	2,130
<b>1,2-DCA</b>	<100	<100	<50	<100	1,140	31
<b>1,1-DCE</b>	2,210	2,460	2,800	806	1,240	151
<b>Ethylbenzene</b>	333	1,720	115	1,180	1,910	45
<b>Methylene Chloride</b>	1,220	2,980	6,530	4,760	21,400	<50
<b>PCE</b>	662	2,150	5,370	3,320	2,130	134
<b>Toluene</b>	560	7,390	579	12,700	13,500	398
<b>1,1,1-TCA</b>	9,370	3,470	444	36,200	114,000	90
<b>TCE</b>	7,160	3,040	1,730	14,300	1,320	45
<b>Xylenes</b>	1,750	7,790	1,014	4,362	4,710	186
<b>Units</b>	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L

In 1996, SCS performed separate soil vapor extraction pilot testing beneath the site at approximately 10' bg and 22' bg. Laboratory analysis identified maximum soil vapor gas concentrations as 1,1,1-TCA (30,300 ppmV) with detectable concentrations of 1,1-DCE, TCE, methylene chloride, toluene, PCE and xylenes. The maximum radius of influence from the various extraction units used were measured as 35 feet at 10' bg and 80 feet at 22' bg.

In November 1997, SCS performed a soil vapor survey at the site. Soil vapor samples were collected at twelve locations at 5' bg. In addition, soil vapor samples were collected at 15' bg in five of the twelve sampling points (See Figure 3 for SCS Soil Vapor Survey Points). The soil vapor survey identified maximum VOC contaminants near the railroad tracks on site, the location where a rail tanker reportedly had an accidental release.

### **3.0) REGIONAL GEOLOGY/HYDROGEOLOGY**

The site is located near the northern boundary of the Santa Fe Springs Plain within the Los Angeles Coastal Plain at an elevation of approximately 150 feet above mean sea level. Surficial sediments consist of fluvial deposits composed of inter-bedded gravel, sand, silt, and clay. Available data from California Water Resources Bulletin No. 104 (June 1961) indicate that the surficial sediments may be Holocene and/or part of the upper Pleistocene Lakewood Formation, which ranges from 40 to 50 feet thick beneath the site. The Lakewood Formation has lateral lithologic changes with discontinuous permeable zones that vary in particle size. Stratified deposits of sand, silty sand, silt, and fine gravel comprising the upper portion of the lower Pleistocene San Pedro Formation underlies the Lakewood Formation.

The site lies within the Central Basin Pressure area, a division of the Central Ground Water Basin, which extends over most of the Coastal Plain. The Gasper aquifer, a part of the basal coarse unit of Holocene deposits, is found within old channels of the San Gabriel and other

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Angeles Chemical Company  
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rivers. The Gasper aquifer may be 40-feet in thickness, with its base at a depth of about 80 to 100-feet bg. The underlying Gage aquifer is found within the upper Pleistocene Lakewood Formation. The Hollydale aquifer is the uppermost regional aquifer in the San Pedro Formation. Bulletin 104 indicates that this aquifer averages approximately 30-feet in thickness in this area, with its top at a depth of about 70 feet bg. The major water producing aquifers in the region are the Lynwood aquifer located approximately 200-feet bg, the Silverado aquifer located at approximately 275-feet bg, and the Sunnyside aquifer located at approximately 600-feet bg.

#### **4.0) SITE GEOLOGY/HYDROGEOLOGY**

Two aquifers were identified by SCS during subsurface investigations performed at the site. A perched aquifer was encountered at approximately 23' bg and the Gaspar/Hollydale aquifer was encountered at 20' to 35' bg by SCS. The groundwater gradient flows to the southwest as identified by SCS (See Figure 4 for Groundwater Gradient). In September 2000, the groundwater was identified between 25.98' bg to 36.15' bg beneath the site.

SCS identified silty clays with some minor amounts of silt and sand in the shallow subsurface from surface grade to approximately 15' bg. Below the silty clay, poorly sorted coarse-grained sand and gravel from 15' bg to 26' bg. A less permeable silty clay layer was identified by SCS between 35' and 50' bg, which contains stringers of fine sand and silt that is part of the Gaspar/Hollydale aquifer.

#### **5.0) SCOPE OF WORK**

BEII proposes that a soil vapor gas survey be performed at the site to confirm the lateral extent of VOC soil vapors in the vadose zone beneath the site using a mobile laboratory to make real time field decisions. The proposed work is submitted to the DTSC, the lead regulatory agency overseeing the site, for approval prior to commencement. Soil vapor gas collection points will be advanced to 10' bg and 20' bg with a direct push hydraulic rig supplied by HP Labs, an environmental licensed drill company (See Figure 5, BEII Proposed Soil Vapor Sample Locations). Should no detectable concentrations of VOCs be identified at 10' bg, then no soil gas sample will be collected at 20' bg in the same bore hole. The spacing between soil gas survey points along the northern and southern boundaries will be no more than 20-feet on center. If VOCs are encountered along the property line, then additional sampling points will be located between the initial sampling points.

The probes will be inserted with a direct push rig provided by HP Labs standard operating procedure (SOP) (See Appendix A for HP Labs SOP). Soil vapors will be collected using the HP Labs SOP for soil gas sampling (See Appendix A for HP Labs SOP). Soil gas sample collection will be performed in accordance with LARWQCB guidelines (Appendix B for LARWQCB guidelines). Soil gas samples will be collected in glass tight syringes and analyzed on-site by HP Labs, a certified toxics analysis mobile laboratory for VOCs using EPA method 8260. A separate

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syringe will be used for each soil gas sample collected to avoid cross-contamination.

**5.1) Analytical Methods and Quality Assurance**

A California Department of Health Services certified mobile laboratory (HP Labs) will conduct the chemical analysis of site samples. The mobile laboratory will maintain strict conformance to EPA standard methodologies, quality assurance/quality control (QA/QC) protocols and standard laboratory practices supporting EPA procedures (See Appendix A for HP Labs QA/QC procedures).

**5.2) Schedule**

It is anticipated that the soil gas survey will commence in November 2000, following acceptance of the work plan by the DTSC. Upon completion of work, a report of summarizing the work, evaluating the quality of the analytical data, interpretation of the data and recommendations for additional work, if needed, to resolve any data gaps will be submitted to the DTSC for review within forty-five days. The report will be signed by a California Registered Civil Engineer that has overseen site activities.

**6.0) FIELD DOCUMENTATION AND CHAIN-OF-CUSTODY**

The following sections describe the recording system for documenting all site field activities and the sample Chain-of-Custody Program.

**6.1) Field Log Book**

An accurate chronological recording of all field activities is vital to the documentation of any environmental investigation. To accomplish this, bound and numbered field logbooks will be maintained by the field team to provide a daily record of significant events, observations, and deviations from the work plan and measurements collected during the field activities. The records will contain sufficient information so that the work activities can be reconstructed without relying on the collector's memory. All entries will be signed, dated and made with waterproof ink. Corrections to the logbook will be made by drawing one line through the error, initialing and dating. The logbook will always be stored in a secure location.

**6.1.1) Chain-of-Custody Record and Request for Analysis Report**

Chain-of-Custody records establish the documentation necessary to trace sample possession from the time of collection to analysis. A serialized Chain-of-Custody and Request for Analysis Report will be completed and will accompany each batch of samples. The record will contain the following information.

**Soil Gas Survey Work Plan  
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October 5, 2000**

- \* Project name and number;
- \* Request for Analysis control number (for cross reference);
- \* Names of sampling team members;
- \* Laboratory destination;
- \* Carrier/waybill number;
- \* Sample number;
- \* Sample location and description;
- \* Date and time collected;
- \* Sample type;
- \* Container type;
- \* Special instructions;
- \* Possible sample hazards;
- \* Signatures of persons involved in the chain-of-possession.

When sample custody is transferred to another individual, the samples must be relinquished by the present custodian and received by the new custodian. This will be recorded at the bottom of the Chain-of-Custody Record and Request for Analysis Report where the persons involved will sign, date and note the time of transfer. During field operations, each project geologist will act as the custodian for the samples he or she collects. Samples will not be left unattended unless placed, along with the Chain-of-Custody Record, in a secure container.

The Chain-of-Custody Record and Request for Analysis Report is a multi-part form that allows the record to be kept in duplicate. One copy will accompany the sample shipment to the laboratory and one copy will be kept with the field logbook. All documents that accompany shipments will be enclosed in zip-lock bag and taped to the inside top cover of the shipping container.

Chain-of-Custody and Request for Analysis Reports provide official communication to the laboratory by listing the particular analysis required for each sample. This also furnishes further evidence that the Chain-of-Custody is complete. The form will contain the following information:

- \* Cross-reference to the Chain-of-Custody Record;
- \* Project name and number;
- \* Sample number;
- \* Sample volume;
- \* Preservative as required;
- \* Requested testing program;
- \* Required turnaround time;
- \* Possible hazard identification;
- \* Sample disposal requirements;

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Angeles Chemical Company  
1000-120  
October 5, 2000**

The form will be signed and dated by the receiving laboratory sample management custodian.

**6.1.2) Sample Identification**

Sample labels prevent the misidentification of samples. Following sample collection, labels will be affixed to each sample container. Labels will record the following type of information.

- \* Project name and number;
- \* Sample identification number;
- \* Name and sample collector;
- \* Date and time of collection;
- \* Analytical parameters;
- \* Known hazards;
- \* Pertinent comments;

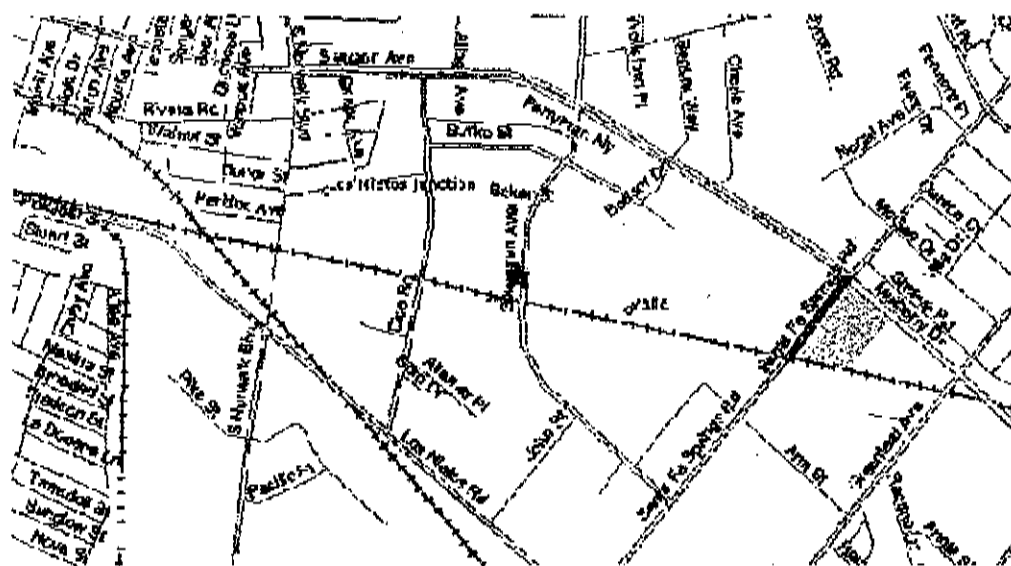
Labels will be sufficiently durable to remain legible even when wet.

**7.0) HEALTH AND SAFETY PLAN**

The purpose of the project Health and Safety Plan (HASP) is to provide guidelines and procedures to ensure the health and physical safety of people working at the Angeles Chemical Company facility. The goal of the HASP is to provide precautionary and responsive measures for the protection of on-site personnel, the general public and the environmental. A HASP is included as Appendix C.



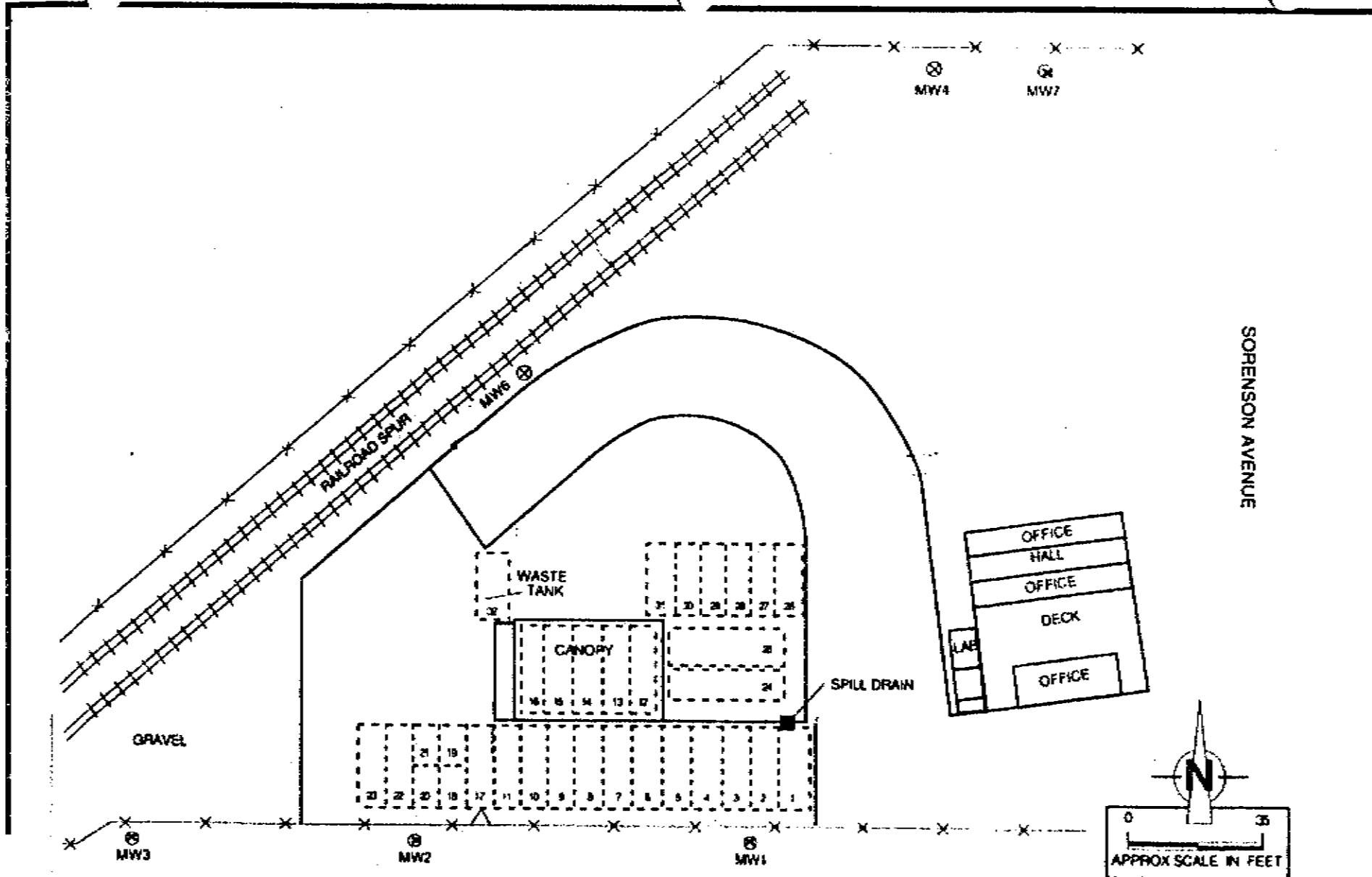
# Figures



Blakely Environmental  
Investigations, Inc.  
P.O. Box 339  
Wrightwood, CA 92397

**Site Location**  
**Angeles Chemical Company**  
**8915 Sorensen Avenue**  
**Santa Fe Springs, CA**

**Figure 1**



Taken from SCS Report

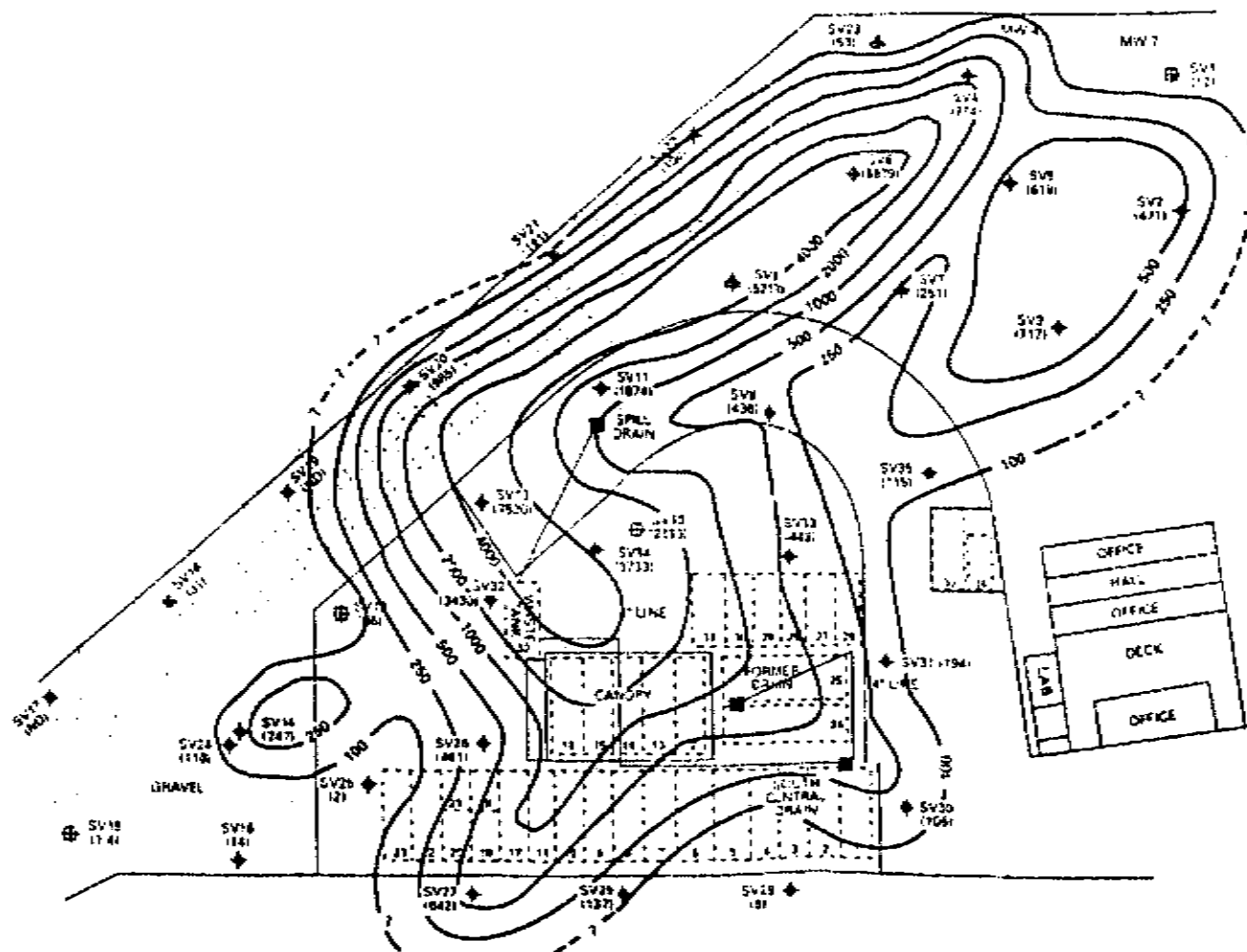
Blakely Environmental  
Investigations, Inc.  
P.O. Box 339  
Wrightwood, CA

## SCS WELL LOCATIONS

Angeles Chemical Company  
8915 Sorensen Avenue  
Santa Fe Springs, CA

**Figure 2**

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SORENSEN AVENUE

Taken from SCS Report

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Investigations, Inc.  
P.O. Box 339  
Wrightwood, CA

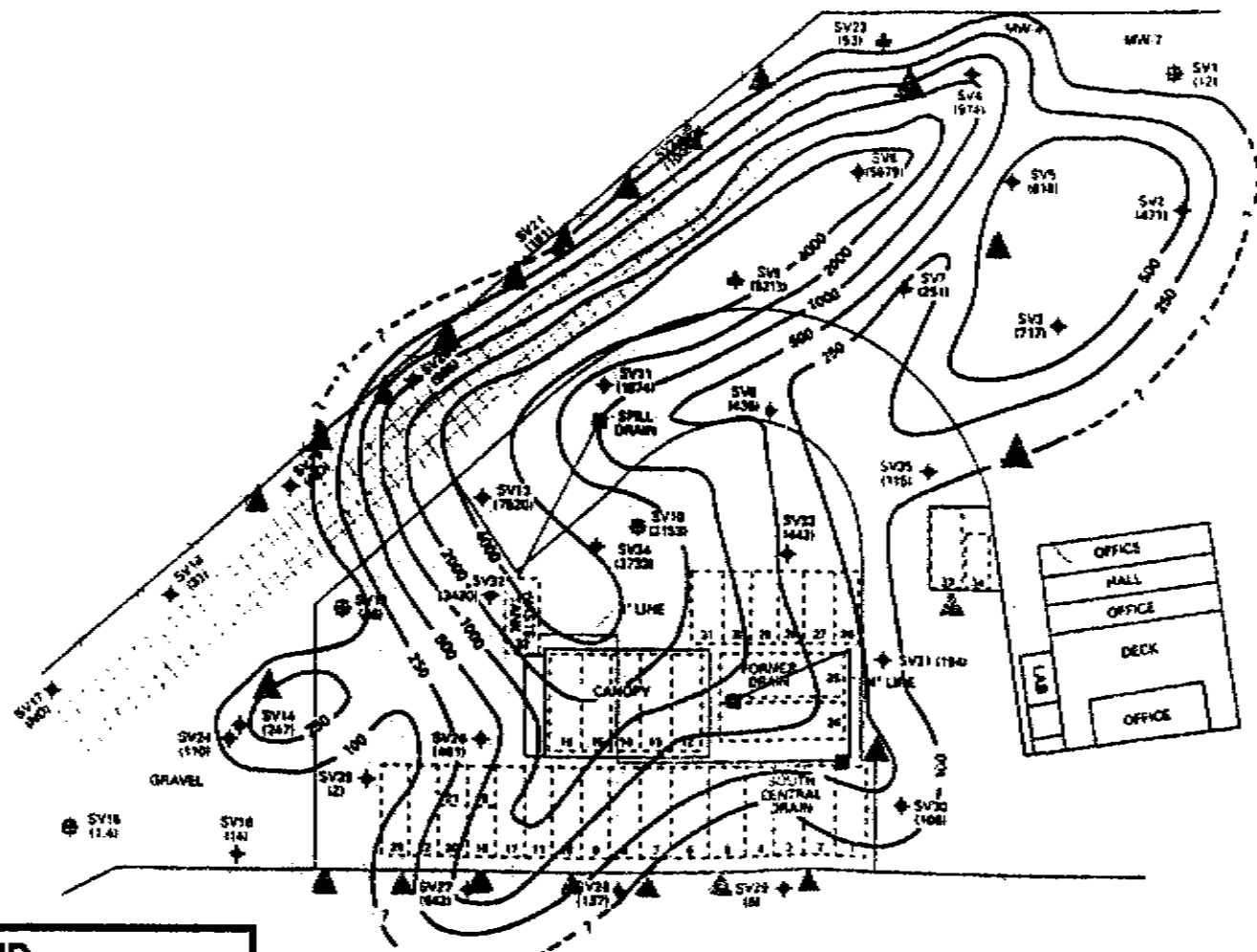
## SCS Soil Vapor Survey Points

Angeles Chemical Company  
8915 Sorensen Avenue  
Santa Fe Springs, CA

**FIGURE 3**

ANINS000180





**LEGEND**

▲ Proposed BELL Soil Gas Survey Points

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Wrightwood, CA

**BELL Soil Vapor Survey Points**

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Santa Fe Springs, CA

**FIGURE 5**

ANINS000182

# Appendix A

# HP Labs

148 S. VINEWOOD STREET

ESCONDIDO, CA 92029

PHONE (760) 735-3208 • FAX (760) 735-2469

## SOIL VAPOR OPERATING PROCEDURES (SOP) FOR RWQCB WELL INVESTIGATION SITES (WIP)

Revised March 1998

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- Surrogates
- Blanks
- Sample Holding Time
- Calculation of Soil Vapor Concentration



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## **SOIL VAPOR SAMPLING PROCEDURES**

### ***Probe Construction***

HP Labs uses two types of soil vapor probes. For shallow surveys (<10 feet), the probes are driven manually and are constructed of 5/8-inch diameter, stainless steel, equipped with a hardened, reverse-threaded steel tip. Nominal lengths are 6 feet although additional lengths may be added. For depths exceeding 10 feet, probes are installed using HP's direct push sampling system. These probes are constructed of 1 inch diameter stainless steel with an expendable point. An inert 1/8-inch polypropylene nylaflow tube runs down the center of both probes to sampling ports beneath the tip.

### ***Probe Insertion***

The smaller probes are driven into the ground with an electric rotary hammer. Once inserted to the desired depth, the probe is rotated 3 to 5 turns in a clockwise direction, which opens the tip and exposes the vapor sampling ports. When using the direct push rig, probes are hydraulically or percussion driven into the ground. Once at the desired depth, the probe is raised ~2 inches which exposes the sampling ports. Both designs prevent clogging of the sampling ports and cross-contamination from soils during insertion.

### ***Soil Gas Sampling***

Soil vapor is withdrawn from the nylaflow tubing using a small volume (<100 cc) syringe connected via an on-off valve. Enough vapor is purged to flush 4 to 8 dead volumes of the probe and fill it with in-situ soil vapor. The next 20 cc of gas are withdrawn in the syringe, plugged, and immediately transferred to the mobile lab for analysis within minutes of collection. Additional soil vapor samples may be collected and stored in gas-tight containers as desired.

### ***Flushing & Decontamination Procedures***

To minimize the potential for cross-contamination between sites, all external probe parts are cleaned of excess dirt and moisture prior to insertion. The internal nylaflow tubing and sampling ports are flushed with hundreds of ccs of ambient air between samples. If water, dirt, or any material is observed in the tubing, the tubing is replaced with fresh tubing. If concentrations greater than 100 ppmv are detected for any compound (except methane), the tubing is replaced.

Sampling syringes are opened and exposed to outside air on a clean surface to allow any volatiles to escape after each use. If concentrations greater than 100 ppmv are detected for any compound (except methane), the syringe is discarded.

### ***Field Collection Log***

The field technician completes a logsheet summarizing depth of penetration, refusal, which probe is used on each sampling location, when tubing is replaced, any visual contamination on the probe, OVM readings as applicable, and any other unusual occurrences at a particular sampling location.

## SOIL VAPOR ANALYTICAL METHODOLOGY

### *Operating Conditions & Instrumentation*

#### **Halogenated, Aromatic & Total Hydrocarbons by EPA 8260**

**Instrument:** Hewlett-Packard 6890/5973 or 5890/5972 GCMS

**Column:** 60 meter HP-624, 0.32mm x 1.8u.

**Carrier flow:** Helium at 15 ml/min.

**Detectors:** Quadrupole MS, full scan mode.

**Column oven:** 20°C for 1 min, 35°C to 230°C at 8°C/min.

### *Standard Preparation*

**Primary (stock) standards** are purchased from certified, traceable suppliers.

**Secondary (Working) Standards** are made monthly by diluting primary standard.

**Neat (Pure) Standards** of many compounds are carried in the laboratory to enable on-site preparation of compound-specific standards as appropriate.

**Laboratory Control Standard (QC Check)** is prepared at the midpoint concentration from a standard purchased from a source different than the primary standards.

Lot numbers and preparations of all standards are recorded on a log sheet in kept in the mobile laboratory.

### *Instrument Initial Multipoint Calibration*

Three point calibration curves for each target component are prepared by analyzing low, mid, & high calibration standards covering the expected range of values, typically from 1 ug/l to 40 ug/l-vapor. The low concentration standard will be no more than 5 times the reported MDL.

### *Daily Continuing Calibration*

Continuing Calibration is performed at the start of each day by injecting a mid-range calibration standard. Acceptable continuing calibration agreement: +/- 15% to the calibration curve/20% for gases.

### *Laboratory Control Standard (QC Check Samples)*

A QC check sample, prepared from an independent source, is analyzed at the end of each day. Acceptable agreement is +/-20% to the calibration curve.

***Injection of Soil Vapor Samples***

Vapor samples are withdrawn from the sampling syringe with a 5 cc syringe and injected directly into a sampling port on the gas chromatograph. The injection syringe is flushed 2 times with the sample prior to injection. Injection syringes are cleaned between injections and discarded if values greater than 100 ppmv of any compound are measured.

***Compound Confirmation***

Compound identification by mass spectral pattern is unequivocal, no second column required.

***Quantification***

Samples are quantified by comparing the sample response to the average response factors for each compound from the existing calibration curve. For samples exceeding the highest calibration standard by 50%, the sample is rerun either after dilution or by injecting a smaller volume.

***Surrogates***

Four surrogate compounds are added to each sample and standard and the recovery measured. If the recoveries exceed +/- 25%, samples will be reanalyzed.

***Blanks***

Blanks are analyzed at the start of each day and more often as appropriate depending upon the measured concentrations. Typically, when values exceeding 100 ppmv are encountered, additional blanks may be analyzed.

***Sample Holding Time***

Soil vapor samples are not stored, but analyzed immediately upon collection.

# Appendix B

## ATTACHMENT C

### STATE OF CALIFORNIA California Regional Water Quality Control Board Los Angeles Region

#### INTERIM GUIDANCE FOR ACTIVE SOIL GAS INVESTIGATION (February 25, 1997)

##### Introduction

Volatile organic compounds (VOCs) within the unsaturated zone partition into the adsorbed, dissolved, free liquid, and vapor phases. Measurement of VOCs through an active soil gas investigation allows: 1) evaluation of whether waste discharges of VOCs have occurred which may impact groundwater, 2) determination of spatial pattern and extent of vapor phase soil contamination, 3) establishment of vapor distribution for the design of soil vapor extraction (SVE) system, and 4) determination of the efficiency of reduction in threat to groundwater from any cleanup action, including SVE. The work plan should include, but not be limited to, the following:

##### 1.0 Survey Design

###### 1.1

Provide a scaled facility map depicting potential sources and proposed sampling points. Include locations and coordinates of identifiable geographic landmarks (e.g., street center-line, benchmark, street intersection, wells, north arrow, property line).

###### 1.2

Locate initial sampling points in potential source areas and areas with known soil contamination using an adjustable 10 to 20 foot grid pattern. Provide rationale for the number, location and depth of sampling points. Screen the remainder of the site with a 100-foot or less grid pattern.

###### 1.3

Conduct a close interval (10 to 20 foot grid pattern) and multi-level sampling (5 to 10 feet vertical distance between points) in areas with known or relatively high VOC concentrations.

###### 1.4

Use an on-site mobile laboratory with laboratory-grade certifiable instrumentation and procedures for real-time analysis of individual VOCs. Non-specific portable organic vapor analyzers and/or GC-based handheld detectors may not be used for analysis, except for daily or weekly vapor monitoring during SVE.

###### 1.5

Maintain flexibility in the sampling plan such that field modifications (grid pattern density, location and depth) can be made as real-time evaluation of

analytical test results occurs. Include in the work plan decision-making criteria for these adjustments and explain decisions in the report. Field decisions shall be made in consultation with Regional Board staff.

###### 1.6

Re-sample at any sampling point if anomalous data (i.e., 2 to 3 orders of magnitude difference from surrounding samples) are obtained. Board staff may require additional points to resolve the spatial distribution of the contaminants within the interval in question.

##### 2.0 Sample Collection

###### 2.1

Obtain samples at an adequate depth (nominally 5 feet) below ground surface (bgs) to minimize potential dilution by ambient air.

###### 2.2

Conduct a site-specific purge volume versus contaminant concentration test at the start of the initial soil gas survey and vapor monitoring well sampling. The purpose of the test is to purge ambient air in the sampling system with minimal disturbance of soil gas around the probe tip. Conduct this test based on soil type and where VOC concentrations are suspected to be highest. Describe specific method and equipment to determine optimal purge rates and volumes. Take into account the potential sorption of target compounds to the tubing and adjust the purge rate and time to achieve the optimal purge volume. Limit the sampling vacuum to collect proper samples. Optimum purge volume may be compound specific. "Lighter" early eluting VOCs, such as vinyl chloride, may reach their highest concentration with less purging than "heavier" late eluting VOCs like PCE. Therefore, optimize the purge volume for the compound(s) of greatest concern.

###### 2.3

Explain the expected zone of influence for sample points, taking into consideration soil types, land cover, drive point construction and sample purge rate/time/volume. The vertical zone of influence for purging and sampling must not intersect the ground surface.

###### 2.4

Discuss soil gas sample collection and handling

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procedures. Discuss the procedures to prevent collection of samples under partial vacuum and the methods to minimize equipment cross-contamination between sampling points.

## 2.5

Avoid making a pilot hole (e.g., using a slam bar) prior to inserting the probe rod, except to drill through asphalt or concrete. The process of making a pilot hole may promote vapor contaminant aeration and result in lower sample concentration.

## 2.6

Specify that the sampling equipment (e.g., gas tight syringe, sorbent trap) will not compromise the integrity of the samples. Tedlar bags may only be used for qualitative analysis.

## 2.7

Assure that the probe tip, probe and probe connectors have the same diameter to provide a good seal between the formation and the sampling assembly. If a space develops between the probe and the formation, as a result of probe advancement, seal (e.g., with bentonite) the area around the probe at the surface to minimize the potential for ambient air intrusion.

## 2.8

Some sampling systems (e.g., Geoprobe) utilize the probe rod as a conduit for the tubing that connects to the probe tip. Assure a tight fit between the tubing and probe tip to minimize potential for leakage and dilution of the sample.

## 2.9

Follow the sampling method specified in the soil gas consultant's standard operating procedure (SOP). Discuss with Board staff any deviations from the SOP before it is implemented in the field.

## 3.0 Laboratory Analysis of Soil Gas Samples

### 3.1 Primary Target Compounds

1. Carbon tetrachloride
2. Chloroethane
3. Chloroform
4. 1,1-Dichloroethane
5. 1,2-Dichloroethane
6. 1,1-Dichloroethene
7. cis-1,2-Dichloroethene
8. trans-1,2-Dichloroethene
9. Dichloromethane (methylene chloride)
10. Tetrachloroethene
11. 1,1,1,2-Tetrachloroethane
12. 1,1,2,2-Tetrachloroethane
13. 1,1,1-Trichloroethane
14. 1,1,2-Trichloroethane
15. Trichloroethene

16. Vinyl chloride
17. Benzene
18. Toluene
19. Ethylbenzene
20. Xylenes
21. Trichlorofluoromethane (Freon 11)
22. Dichlorodifluoromethane (Freon 12)
23. 1,1,2-Trichloro-trifluoroethane (Freon 113)

### 3.2 Other Target Compounds

Analyze for other VOCs (e.g., methyl ethyl ketone, methyl isobutyl ketone, ethylene dibromide, petroleum hydrocarbons, etc.) based upon site history and conditions.

### 3.3 Detection Limit (DL)

Attain a DL of not more than 1 µg/L for all target compounds. A higher DL is acceptable only for the compound(s) whose concentration exceeds the initial calibration range.

### 3.4 Detectors

Use the following detectors in appropriate combinations:

Electrolytic conductivity detector (ELCD) (e.g., Hall)  
Photoionization detector (PID)

Flame ionization detector (FID)

Mass spectrometer (MS)

Electron capture detector (ECD)

### 3.5.0 Identification of Calibration Standards & Laboratory Control Sample (LCS)

#### 3.5.1

Properly and clearly identify all calibration standards and LCS. The identification must agree with the data on record for the standards and LCS.

#### 3.5.2

Prepare LCS from a second source standard that is totally independent from the standards used for the initial calibration. Second source means a different supplier (whenever possible) or a different lot from the same supplier.

### 3.6.0 GC Conditions

#### 3.6.1

Use a type of column that can separate all the target compounds. Coelution of the target compounds is not acceptable unless the compounds are distinguished and quantified by two different types of detectors in use at that time.

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#### 3.6.2

Analyze the initial calibration and daily mid-point calibration check standards, LCS, blank, and samples using the same GC conditions (i.e.,

detector, temperature program, etc.).

### 3.6.3

Use a GC run time that is long enough to identify and quantify all the target compounds.

## 3.7.0 Initial Calibration (Record in Table 1)

### 3.7.1

Perform an initial calibration:

1. for all 23 compounds listed in Section 3.1;
2. when the GC column type is changed;
3. when the GC operating conditions have changed;
4. when the daily mid-point calibration check cannot meet the requirement in Section 3.8.3; and
5. when specified by Regional Board staff based on the scope and nature of the investigation.

### 3.7.2

Include at least three different concentrations of the standard in the initial calibration, with the lowest one not exceeding 5 times the DL for each compound.

### 3.7.3

Calculate the response factor (RF) for each compound and calibration concentration prior to analyzing any site samples. Calculate the average RF for each compound. The percent relative standard deviation (%RSD) for each target compound must not exceed 20% except for the following compounds which must not exceed 30%:

Trichlorofluoromethane (Freon 11)  
Dichlorodifluoromethane (Freon 12)  
Trichlorotrifluoromethane (Freon 113)  
Chloroethane  
Vinyl chloride

### 3.7.4

Verify the true concentration of the standard solutions used with the LCS after each initial calibration. Conduct the verification using a LCS with a mid-point concentration within the initial calibration range. The LCS must include all the target compounds. The RF of each compound must be within  $\pm 15\%$  difference from the initial calibration, except for freon 11, 12 and 113, chloroethane, and vinyl chloride which must be within  $\pm 25\%$  difference from the initial calibration.

## 3.8.0 Daily Mid-point Calibration Check (Record in Table 1)

### 3.8.1

Check the calibration using the calibration standard solution with a mid-point concentration within the linear range of the initial calibration before any sample is analyzed.

### 3.8.2

Include in the daily mid-point calibration check standard the following compounds and every compound expected or detected at the site:

1. 1,1-Dichloroethane
2. 1,2-Dichloroethane
3. 1,1-Dichloroethene
4. cis-1,2-Dichloroethene
5. trans-1,2-Dichloroethene
6. Tetrachloroethene
7. 1,1,1-Trichloroethane
8. 1,1,2-Trichloroethane
9. Trichloroethene
10. Benzene
11. Toluene
12. Xylenes

### 3.8.3

Assure that the RF of each compound (except for freons 11, 12 and 113, chloroethane, and vinyl chloride) is within  $\pm 15\%$  difference from the initial calibration's average RF. The RF for freons 11, 12 and 113, chloroethane, and vinyl chloride must be within  $\pm 25\%$ .

## 3.9.0 Blank

### 3.9.1

Analyze field blank(s) to detect any possible interference from ambient air.

### 3.9.2

Investigate and determine the source(s) and resolve any laboratory contamination problem prior to analyzing any samples if the blank shows a measurable amount ( $\geq 1 \mu\text{g/L}$ ) of the target compound(s).

## 3.10.0 Sample Analysis

### 3.10.1

Assure that the requirements for initial calibration, daily mid-point check, blank, and LCS are met before any site samples are analyzed.

### 3.10.2

Analyze samples within 30 minutes after collection to minimize VOC loss. Longer holding time may be allowed if the laboratory uses a special sampling equipment (e.g., sorbent trap, glass bulb) and demonstrates that the holding time can exceed 30 minutes with no decrease in results.

### 3.10.3

Assure that the concentrations of constituent(s) in a sample do not exceed 50% of the highest concentration in the calibration range. Reanalyze the sample using a smaller volume or dilution if the detected concentration exceed 50% of the highest concentration in the calibration range.

#### **3.10.4**

Attain DL of not more than 1 µg/L for all target compounds. If lesser sample volumes or dilutions are used to off-set possible high concentration of constituents in the initial run, use the initial run to calculate the results for constituents that are not affected by the high concentration so that DL of 1 µg/L for these compounds can be achieved.

#### **3.10.5**

Quantify sample results using the average RF from the most recent initial calibration.

#### **3.10.6**

Add surrogate compounds to all samples. Assure that the surrogate compound concentration is within the initial calibration range. Two to three different surrogate compounds [one aromatic hydrocarbon and two chlorinated compounds (early and middle eluting, except gases)] should be used to cover the different temperature programming range for each GC run.

#### **3.10.7**

Calculate the surrogate recovery for each GC run. Surrogate recovery must not exceed ±25% difference from the true concentration of the surrogate, as the sample result would be considered questionable and may be rejected by this Regional Board.

### **3.11.0 Compound Confirmation**

#### **3.11.1**

Conduct compound confirmation by GC/MS whenever possible. Use second column confirmation with surrogate for compound confirmation if GC/MS is not used.

#### **3.11.2**

Add surrogate compounds to standards and site samples for second column confirmation to monitor the relative retention time (RRT) shift between GC runs. This is required for better compound identification when ELCD, PID, ECD, and FID are used for analysis.

#### **3.11.3**

Usually one sample is adequate and quantitation is not required for second column confirmation. Second column confirmation can be done with a different GC. The representative sample can be collected in Tedlar bag and confirmation can be done off site.

#### **3.11.4**

Second column confirmation is not necessary if the compounds present have been confirmed from previous soil gas investigations.

### **3.12.0 Samples with High Concentration**

#### **3.12.1**

DL may be raised above 1 µg/L for compounds with high results (i.e., the limit as specified in Section 3.10.3) and those closely eluting compounds for which quantitation may be interfered by the high concentrations.

#### **3.12.2**

Quantify sample results according to Section 3.10.4 for analytes which are not affected by the high concentration compounds.

#### **3.12.3**

If high VOC concentration in an area is known from previous soil gas analysis, Sections 3.12.1 and 3.12.2 are not necessary when analyzing samples from the area in question.

#### **3.12.4**

When dilution with ambient air is used for samples with high results, dilute and analyze in duplicate each day at least one sample to verify the dilution procedure. Ambient air should be checked periodically during each day of analysis.

### **3.13.0 Shortened Analysis Time**

#### **3.13.1**

Shorten the GC run time under the following conditions only:

1. The exact number and identification of compounds are known from previous soil and soil gas investigations; and
2. The consultant has been given permission by Regional Board staff to analyze only for specific compounds.

#### **3.13.2**

Meet the following requirements when shortening GC run-time:

1. Regional Board staff must approved the shortened run time;
2. The compounds must not coelute;
3. Perform initial calibration and daily mid-point calibration check and analyze LCS and samples under the same conditions as the shorter GC run-time;



4. Quantitate using the average RF from the initial calibration utilizing the shorter run-time; and
5. Perform a normal run-time analysis whenever peaks are detected within retention time windows where coelution, as indicated by the calibration chromatograms, is likely.

### **3.14.0 Last GC Test Run Per Day of Analysis** (Record in Table 1)

#### **3.14.1**

A LCS as the last GC run of the day is not mandatory, except under conditions in Section 3.14.2. Include the same compounds used in the daily mid-point calibration check analysis, as listed in Section 3.8.2. Attain RF for each compound within  $\pm 20\%$  difference from the initial calibration's average RF, except for freons 11, 12, 113, chloroethane, and vinyl chloride which must be within  $\pm 30\%$ .

#### **3.14.2**

Analyze a LCS at the detection limit concentration instead of the mid-point concentration if all samples from same day of analysis show non-detect (ND) results. The recovery for each compound must be at least 50%. If it is less than 50%, all the ND results of the samples become questionable.

### **3.15.0 On-site Evaluation Check Sample**

#### **3.15.1**

Analyze on-site the evaluation check sample as part of the QA/QC procedures when presented with such a check sample by Regional Board staff. Provide preliminary results on-site.

#### **3.15.2**

If the results show that the soil gas consultant has problems with the analysis, all the results generated during the same day may be rejected. Correct all problems before any more samples are analyzed.

### **3.16.0 Site Inspection**

#### **3.16.1**

Unannounced, on-site inspection by Regional Board staff is routine. Provide upon request hard copies of the complete laboratory data, including raw data for initial calibration, daily mid-point check, LCS and blank results. Failure to allow such inspection or to present these records or field data may result in rejection of all sample results.

#### **3.16.2**

The soil gas consultant must understand the instruments, analytical and QA/QC procedures and must be capable of responding to reasonable

inquiries.

### **3.17.0 Recordkeeping in the Mobile Laboratory** Maintain the following records in the mobile laboratory:

1. A hard copy record of calibration standards and LCS with the following information:
  - a. Date of receipt
  - b. Name of supplier
  - c. Lot number
  - d. Date of preparation for intermediate standards (dilution from the stock or concentrated solution from supplier)
  - e. ID number or other identification data
  - f. Name of person who performed the dilution
  - g. Volume of concentrated solution taken for dilution
  - h. Final volume after dilution
  - i. Calculated concentration after dilution
2. A hard copy of each initial calibration for each instrument used for the past few months.
3. The laboratory standard operating procedures.
- 4.0 **Reporting of Soil Gas Sample Results and QA/QC Data** (Record in Table 1 and 2)
  - 4.1 Report all sample test results and QA/QC data using the reporting formats in Appendix A. Compounds may be listed by retention time or in alphabetical order. Include in the table of sample results all compounds in the analyte list. Report unidentified or tentatively identified peaks. Submit upon request all data in electronic format and raw data, including the chromatograms. Identify the source(s) of the contaminants detected in the investigation, as indicated by the data.
  - 4.2 Report the following for all calibration standards, LCS and environmental samples:
    1. Site name
    2. Laboratory name **ANINS000193**
    3. Date of analysis
    4. Name of analyst
    5. Instrument identification
    6. Normal injection volume
    7. Injection time
    8. Any special analytical conditions/remark

#### **4.3**

Provide additional information, as specified, for different types of analyses. Tabulate and present in a

clear legible format all information according to the following grouping:

1. Initial calibration

- a. Source of standard (**STD LOT ID NO.**)
- b. Detector for quantitation (**DETECTOR**)
- c. Retention time (**RT**)
- d. Standard mass or concentration (**MASS/CONC**)
- e. Peak area (**AREA**)
- f. Response factor (**RF**)
- g. Average response factor (**RF<sub>ave</sub>**)
- h. Standard deviation (**SD<sub>n-1</sub>**) of RF, i.e.,

$$\frac{n}{[\sum (RF_{ave} - RF)^2 / (n - 1)]^{1/2}}$$

n = number of points in initial calibration

- i. Percent relative standard deviation (**% RSD**), i.e., (**SD<sub>n-1</sub> / RF<sub>ave</sub>**) x 100 (%)
- j. Acceptable range of %RSD (**ACC RGE**)

2. Daily calibration check sample

- a. Source of standard
- b. Detector
- c. Retention time (**RT**)
- d. Standard mass or concentration
- e. Peak area
- f. Response factor (**RF**)
- g. Percent difference between RF and RF<sub>ave</sub> from initial calibration (**% DIFF**)
- h. Acceptable range of %DIFF (**ACC RGE**)

3. LCS. Same format as daily calibration

4. Environmental sample

- a. Sample identification
- b. Sampling depth
- c. Purge volume
- d. Vacuum pressure
- e. Sampling time
- f. Injection time
- g. Injection volume
- h. Dilution factor (or concentration factor if trap is used)
- i. Detector for quantitation
- j. Retention time (**RT**)
- k. Peak area
- l. Concentration in µg/L (**CONC**)
- m. Total number of peaks found by each detector
- n. Unidentified peaks and/or other analytical remarks

5. Surrogate and second column confirmation

Mark RT and compound name on: a) second column chromatogram of standard and b)

second column chromatogram of confirmation sample.

4.4

Discuss the method(s) to be used for data interpolation (contouring). Provide isoconcentration maps for each VOC detected, total chlorinated volatile organics, total aromatic hydrocarbons, and petroleum-based hydrocarbons for each sampling depth, as applicable. Provide cross-section(s) depicting the geology and changes in contaminant concentration with depth, as justified by the data.

5.0 Companion Soil Sampling

5.1

Discuss soil boring locations with Regional Board staff. Locate borings and sampling depths based on all available information including soil gas test results.

5.2

Conduct the soil sampling and analysis per this Regional Board's Well Investigation Program General Requirements for Subsurface Investigations, Requirements for Subsurface Soil Investigation and Laboratory Requirements for Soil and Water Sample Analyses.

6.0 Soil Vapor Monitoring Well/Vertical Profiling

Install soil vapor monitoring wells for vertical profiling in areas where significant VOC concentrations were identified during the vapor investigation. The objectives of vertical profiling are to: 1) assess the vertical distribution of VOCs in the vapor phase within the unsaturated zone, 2) determine the spatial pattern of vapor phase soil contamination at different depths within the unsaturated zone, 3) identify migration pathways at depth along which VOCs may have migrated from sources, and 4) serve as discrete monitoring points to evaluate the efficiency of a cleanup action. Soil vapor monitoring wells offer the opportunity to resample as many times as necessary to monitor soil vapor changes over time.

Address appropriate items in the following sections when conducting vertical profiling.

6.1

Install nested, cluster, and/or multi-port vapor monitoring wells to obtain discrete multi-depth soil vapor data in the unsaturated zone. Provide a schematic diagram of the well design and a cross-section of the site showing the major lithologic units and zones for vapor monitoring.

6.2

Collect undisturbed soil samples if fine-grained soils are encountered during drilling of the boring for the

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probes. Due to air-stripping effect, VOC analysis of soil samples is not acceptable if air drilling method is used. Refer to Section 5.2 for sampling and testing requirements.

#### 6.3

Use all available information (e.g., geologic log, organic vapor concentration reading) to select appropriate depths for vapor monitoring. Install probes at depths with elevated vapor readings (headspace) and/or slightly above fine-grained soils which can retard the migration of VOCs. The deepest probe should be installed above the capillary fringe.

#### 6.4

Consider installing nested vapor probes in the annular space of the groundwater monitoring well to serve as a dual-purpose well if both vapor and groundwater monitoring are required. This design saves costs by installing vapor and groundwater monitoring wells in a single borehole.

#### 6.5

Use small-diameter (e.g.,  $\leq 1/4$ -inch) continuous tubing attached from the vapor probe to the ground surface to minimize purge volume.

#### 6.6

Design and construct the vapor wells to serve as long-term monitoring points to evaluate the efficiency of a cleanup action and soil vapor changes over time. Protect the tubing from being damaged or clogged by subsurface soil materials especially in deep installations (e.g., place inside a PVC casing) or consider using  $1/2$ -inch PVC pipe in place of the tubing. If a tubing is used, consider attaching a weight at the probe tip and/or attaching the tubing onto a supporting pipe or rod to ensure that the probe tip remains in-place during installation.

Properly cap the top end of each tubing/pipe (e.g., control valve) and label each tubing/pipe with the correct sampling depth.

#### 6.7

Attach the bottom-end of the tubing to an appropriate vapor probe (e.g., PVC screen, stainless steel wire screen, stainless steel probe, or brass elbow, etc). If a vacuum pump is used for purging and sampling, include a wire screen around the probe to prevent soil particles from blocking the probe's airways. Ensure that the connection between the tubing and the vapor probe is tight to prevent leakage.

#### 6.8

Place the filter pack (e.g., sand or pea gravel) around each vapor probe and isolate each monitoring zone with bentonite seals. Use an appropriate method (e.g., tremie method) to avoid

bridging or segregation during placement of the filter packs and bentonite seals.

Extend the filter pack to a sufficient distance above the probe to allow for settling of backfill materials. In general, the filter pack should not exceed 3 feet in thickness. In deep borings, the filter pack should extend about four feet above the probe to allow for settling of backfill materials and to reduce the potential for the bentonite seal settling around the probe.

Consider placing fine sand above the filter pack to prevent the bentonite seal from entering the filter pack. Place a minimum of two feet thick bentonite seal above and below the filter pack. Allow sufficient time (e.g., one-half to one hour) for bentonite seal to properly hydrate before placing filter pack or cement-based sealing materials.

#### 6.9

Prevent infiltration of surface runoff and unauthorized access (e.g., use a locking subsurface utility vault).

#### 6.10

Specify the schedule for sampling the vapor probes. In general, soil vapor monitoring is required a minimum of one and two months after installation. Due to the VOC stripping caused by air drilling methods, conduct soil vapor monitoring at least two and four months following well completion. Regional Board staff may require a different sampling schedule and additional sampling based upon site conditions and test results.

#### 6.11

Specify the procedures to properly decommission vapor wells that are no longer needed. The decommissioning activity should achieve an effective and long-term seal of subsurface geologic materials and prevent cross contamination in the subsurface.

### 7.0 Soil Gas Consultants

This Regional Board reserves the authority to review any soil gas consultant's work to assure compliance with all applicable statutes, regulations, orders, and guidelines. It is your responsibility to ascertain that the individual directing the field investigation is professionally qualified and conducts the field work in accordance with the Board's guidance for active soil gas investigations.

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# Appendix C

# **HEALTH & SAFETY PLAN**

**ANGELES CHEMICAL COMPANY  
8915 SORENSEN AVENUE  
SANTA FE SPRINGS, CALIFORNIA**

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Figure 1

Route to Hospital from Site

**ATTACHMENTS**

Attachment 1

Field Team Review Forms

Attachment 2

Tailgate Safety Meeting Form

## **1. HEALTH AND SAFETY PLAN**

Blakely Environmental Investigations, Inc. (BEII), has established this site-specific Health and Safety Plan (HASP) as part of the work plan for all individuals engaged in field assessment activities at the Angeles Chemical Company property located at 8915 Sorensen Avenue, Santa Fe Springs, CA. All site work shall be conducted in a safe manner and comply with EPA, state and local regulations, in particular OSHA 29 CFR, part 1910, and California Administrative Code Title 8. In addition, all site work will comply with BEII Corporate Health and Safety Program and all supporting Standard Operating Procedures. This HASP may be modified during actual field activities, if necessary, as more information and site-specific data is obtained.

Prior to any work on-site, an approved copy of this HASP (latest edition) shall be provided to all employees and subcontractors by the Project Manager. Each subcontractor will be responsible for providing their own HASP. At a minimum the subcontractors' HASP must meet the requirements of this HASP. BEII will review and approve each subcontractor HASP prior to initiation of field work.

### **1.1 PURPOSE AND OBJECTIVES**

The purpose of this site-specific HASP is to provide guidelines and procedures to ensure the health and physical safety of those persons working at the Angeles Chemical Company property. While it may be impossible to eliminate all risks associated with site work, the goal is to provide precautionary and responsive measures for the protection of on-site personnel, the general public and the environment.

The HASP objectives are as follows:

- \* Ensure the safety of all site personnel
- \* Protect the public and the environment
- \* Adhere to BEII Health and Safety procedures

### **1.2 IMPLEMENTATION**

This site-specific HASP, and any additions included in a subcontractor HASP, will be reviewed and the Field Team Review Form (Attachment 1) will be completed by all site personnel prior to their scheduled field work. Whenever the site-specific HASP is revised or amended, personnel will be instructed in the new procedures and required to complete a new Field Team Review Form. The site-specific HASP will be implemented in the field by BEII's Health and Safety Coordinator and/or designated Site Safety Officer.

## **2.0 BACKGROUND**

### **2.1 SITE LOCATION AND DESCRIPTION**

The site is located at 8915 Sorensen Avenue in Santa Fe Springs. The site is an operating chemical packaging facility. Petroleum hydrocarbon impacted soil and groundwater were identified at the site.

### **2.2 SCOPE OF WORK**

Six groundwater wells will be sampled to protocol. In addition, a soil gas vapor survey will be conducted to protocol at the site.

## **3. RESPONSIBILITIES**

### **3.1 HEALTH AND SAFETY COORDINATOR**

As BEII's Health and Safety Coordinator (HSC), Dave Blakely is responsible for directing and implementing the HASP and ensuring that all BEII and subcontractor personnel have been trained in HASP procedures. The HSC will coordinate safety activities with subcontractors and serve as liaison with public officials who might wish to monitor health

and safety activities on-site. The HSC will also ensure that proper protective equipment is available and used in the correct manner, that decontamination activities are carried out correctly, that specific site hazards are noted and accounted for in the Work Plan and that employees have knowledge of the local emergency medical system. The HSC may conduct periodic site audits to ensure compliance with the HASP and to note any additional hazards or concerns. The HSC has stop-work authorization, which shall be executed upon determination that an imminent health or safety hazard exists.

### **3.2 DESIGNATED SITE SAFETY OFFICER**

As BEII's Site Safety Officer (SSO), James Jazmin is responsible for implementing the site-specific HASP in the absence of the HSC. The SSO shall conduct daily tailgate safety meetings and ensure that only authorized personnel are allowed at the site. In addition, the SSO shall ensure that the daily sign-in logs for site persons and visitors are maintained. The SSO shall report any unsafe acts or conditions to the HSC.

The SSO also has stop-work authorization which shall be executed upon determination that an imminent danger to life or health exists. If a stop-work order is issued, due to safety concerns, the HSC shall be contacted immediately and appropriate steps taken to correct the situation.

### **3.3 PROJECT MANAGER**

BEII Project Manager, Hiram Garcia is the direct link between BEII and the Angeles Chemical Company. He is responsible for directing all on-site operations, including the overall implementation of the Health and Safety Program. In addition, the Project Manager is responsible for ensuring that adequate resources and personnel protective equipment are allocated for the health and safety of site personnel. The Project Manager is also responsible for ensuring that the safety personnel (via the HSC) are given free access to all relevant site information that could impact health and safety. He will correct conditions or work practices that could lead to employee exposure to hazardous materials.

### **3.4 OCCUPATIONAL MEDICAL CONSULTANT**

SAN BERNARDINO COMMUNITY HOSPITAL, BEII's Occupational Medical Consultant, will be available to answer medical questions and provide guidance in unexpected situations. The Medical Consultant will recommend appropriate medical monitoring for the site team members.

### **3.5 EMPLOYEES**

All BEII employees working at the site are responsible for reading and understanding the HASP. They will be held accountable for complying with all aspects of the HASP.

### **3.6 SUBCONTRACTORS**

If they desire, subcontractors on the site may provide their own site Health and Safety Plan that must incorporate, at a minimum, BEII's Health and Safety Plan. As described above, BEII's HSC and SSO have authority to ensure that subcontractor employees are following the BEII and subcontractor HASP provisions.

## **4. EMERGENCY PLANNING**

### **4.1 EMERGENCY SERVICES**

Figure 1 illustrates the location of the Angeles Chemical Company property with respect to the Hospital. If an emergency should occur on-site, the Emergency Medical System (911) should be activated.

### **4.2 EMERGENCY TELEPHONE NUMBERS**

Emergency telephone numbers shall be posted on-site and made immediately available at all times. These numbers shall include the following:

**EMERGENCY:**

Fire	(562) 944-9713
Ambulance	911
Police	(562) 409-1850
Emergency Rooms (see Figure 1 for Hospital Routes)	
Presbyterian Intercommunity Hospital	(562) 945-8925
San Bernardino Community Hospital	(909) 988-9211
BEII (Dave Blakely)	(760) 249-5498
Angeles Chemical Company (John Locke)	(562) 945-3911

**NON-EMERGENCY:**

City Fire Department	(562) 944-9713
City Police Department	(562) 409-1850
U.S. Environmental Protection Agency	(202) 260-2090
Emergency Spill Response	911

**5. HAZARD ASSESSMENT**

This hazard assessment is based on available information concerning chemical hazards known or suspected to be present at the Angeles Chemical Company property. The potential risks to site workers are evaluated below.

1. No danger exists from flammability or explosion since petroleum concentrations have been identified at less than 1% of the lower explosive limit of the most volatile constituent of the compound in the subsurface
2. No significant risk of inhalation of petroleum vapors exist due to the extremely low levels identified and the depth at which the concentrations were observed in the subsurface.

**5.1 CHEMICAL EXPOSURE**

Site workers may be exposed to the components of gasoline and chlorinated solvents during field activities, including drilling, sampling and treatment operations. Potential exposure is to petroleum hydrocarbon-contaminated soil and water. At present, the major expected site contaminants are 1,1,1 TCA, TCE, PCE, ethylbenzene, toluene and xylene. A description of some of these chemicals can be found in Table 1. The routes of exposure for hydrocarbons are ingestion, inhalation, skin absorption and eye or skin contact. Measures shall be taken to eliminate personnel exposure through the use of personal protection equipment when engineering controls are not feasible.

Table 1

## Chemical Properties of Suspected Contaminants

Chemical Name	Chemical Formula	CAS#	Description	LEL	UEL	cat (OSHA)	fed (OSHA)	(ACGIH)	(NIOSH)	(NIOSH) IDLH	Carcinogen
Benzene	C <sub>6</sub> H <sub>6</sub>	71432	Clear colorless liquid with aromatic: 5.51 N F bp: 176 N F Flash p: 12 N F	1.3 1.4%	7.1 8.0%	1 ppm	50 ppm (10 min) 5 ppm (15 min)	1 ppm 0.5	.1 ppm (8 hrs)	1 ppm (15 min) 500 ppm	Yes Strong oxidizers, chlorine, bromine
Toluene	C <sub>7</sub> H <sub>8</sub>	108883	Colorless liquid, benzoin like odor flammable mp: -95 to -94.5 N, bp: 110.5 N flash p: 40 N Insol in H <sub>2</sub> O	1.27%	7%	200 ppm 50 ppm	300 ppm 500 ppm (10 min. peak) 200 ppm	100 ppm 50	100 ppm (10 min) 50 ppm	200 ppm (10 min) 500	2,000 ppm 500 Strong oxidizers
Xylene	C <sub>8</sub> H <sub>10</sub>	1330207	Clear Liquid with aromatic colors. bp: 138.5 N flash p: 81 N F	1.1%	7%	100 ppm	--- 100 ppm	--- 100 ppm	100 ppm	<del>200 ppm</del> 900 ppm	1,000 ppm Strong oxidizers
1,1,1 TCA	C <sub>2</sub> H <sub>3</sub> Cl <sub>3</sub>	71-55-6	Colorless liquid, with a mild chloroform-like odor.	7.5%	12.5%	1,000 ppm ↑ 350	--- ↑ 350 ppm	--- 350	---	---	1,000 ppm 700 Strong caustics, strong oxidizers

DEL = 350 ppm

repaired or disposed of. During equipment maintenance activities, proper lockout procedures will be utilized.

In addition, all equipment used on-site including drill rigs or remediation systems will be a minimum distance of ten-feet from overhead high voltage lines.

## **6. HEALTH AND SAFETY TRAINING**

This section describes the health and safety training requirements necessary for participating in field operations at the Angeles Chemical Company property.

### **6.1 TRAINING REQUIREMENTS**

BEII employees and subcontractors who enter the site will be trained to be able to recognize and understand the potential hazards to health and safety associated with the site operations. All BEII employees potentially exposed to hazardous substances will have participated in 40 hours of health and safety instruction and actual field experience under the direct supervision of a trained, experienced supervisor. The objectives of the health and safety training are:

- \* To make each team member aware of the potential hazards they may encounter;
- \* To provide the knowledge and skills necessary to perform the work with minimal risk to worker health and safety;
- \* To make workers aware of the purpose and limitations of safety equipment;
- \* To ensure that workers can safely avoid or escape from emergency situations.

### **6.2 ADDITIONAL TRAINING REQUIREMENTS**

Workers exposed to special hazards during field operations at the Angeles Chemical Company property shall receive additional training as determined by the Project Health and Safety Coordinator. On-site managers and supervisors shall receive all training required for employees whom they supervise, plus eight additional hours of specialized training on management and supervision of such operations. Prior work experience or training will be acceptable provided that it is equivalent to the training requirements specified above. Whenever employees are working on-site, at least one person will be currently certified in Standard First Aid/CPR training.

### **6.3 DAILY SAFETY MEETINGS**

Site-specific "tailgate" safety briefings will be conducted daily by the SSO or his designee to discuss the day's operations, review any modifications to the HASP and ensure that site personnel have the necessary information to conduct their jobs safely. The Tailgate Safety Meeting Form (Attachment 2) will be completed during this briefing and signed by all personnel in attendance. All completed forms shall be maintained on-site. Upon completion of the project, all forms shall be forwarded to the project Health and Safety files.

### **6.4 TRAINING PROGRAM CONTENT**

BEII's Health and Safety Training Program involves instruction, self-study and field exercises in the following areas:

- \* Science of Hazardous Materials: Chemical and physical properties of hazardous materials.
- \* Toxicology: Dose response, routes of exposure, toxic effects and exposure limits.
- \* Industrial Hygiene: Selection and use of proper protective equipment and clothing to ensure

## **5.2 FIRE AND EXPLOSION**

The risk of fire or explosion during site activities is present, though minimal. Toluene is considered flammable and is a known contaminant on-site. The lower explosive limits (LEL) for benzene, toluene and xylene are 1.3 to 1.4 percent, 1.2 percent and 1.1 percent, respectively. Their flash points are 12F, 40F and 81F, respectively.

For added security, smoking will not be allowed on the site except in a designated smoking areas (to be determined). "No Smoking" signs will be prominently displayed at numerous locations. A portable combustible gas monitor may be utilized to monitor the LEL. All work will cease if the percent LEL reaches 20 percent.

## **5.3 OXYGEN DEFICIENCY**

It is not expected that an oxygen-depleted atmosphere will be encountered during site activities. Whenever the risk of encountering an oxygen-depleted atmosphere does exist (confined space entry, for example), precautions will be taken to ensure the safety of all employees. Confined space entries are used only as a last resort, when all other means have been exhausted. BEII uses a special permit system for confined space entry, entailing additional employee training and atmospheric monitoring.

## **5.4 BIOLOGIC HAZARDS**

It is not anticipated that poisonous plants or hazardous animals will be encountered during site activities.

## **5.5 SAFETY HAZARDS**

Minimal safety hazards are expected onsite. All work will be performed during daylight hours and not within any structures located on-site to minimize the need for artificial illumination.

## **5.6 HEAT RELATED DISORDERS**

Wearing personal protective equipment while conducting site operations puts the individual worker at considerable risk of developing heat-related disorders, collectively called heat stress. Heat emergencies fall into three categories: heat cramps, heat-exhaustion, and heatstroke (i.e., sunstroke). Without intervention and resolution of the problem, muscle cramps caused by loss of salt from heavy sweating can lead to heat-exhaustion (caused by dehydration) which can lead to heatstroke. Early symptoms include dizziness, fatigue, muscle cramps, nausea, profuse sweating, thirst, weakness, and lightheadedness. Later symptoms of heat-exhaustion include cool moist skin, dilated pupils, headache, pale skin, irrational behavior, nausea, vomiting, and unconsciousness. Symptoms of heatstroke are dry, hot, red skin, fever, dark urine, confusion, rapid slow breathing, rapid weak pulse, seizures, small pupils, unconsciousness. On-site personnel will stay hydrated. Mandatory water breaks will be taken every 30 minutes to avoid dehydration. Monitoring will be performed to avoid heat stress, using both oral temperatures and radial pulse rate for all workers engaging in heavy labor at ambient temperatures over 70° F.

## **5.7 NOISE**

Excess exposure to noise above 85 decibels (dBa) is not anticipated during work at the Angeles Chemical Company property, however, hearing protection will be mandatory. In general, excess noise is "suspected" when people standing next to each other are not audible to one another. A Hearing Conservation Program has been established by BEII and is in effect for all site locations.

## **5.8 ELECTRICAL HAZARDS**

All electrical work, installation and wire capacities shall be in accordance with the provisions of the National electric Code. Power cords will be UL-listed heavy duty and include a grounding plug. All power cords and receptacles shall be inspected before use to ensure that the casings are not cracked, grounding prongs are attached and that there are not other visible defects. If any defects are found, the cord, receptacle or equipment shall be tagged and placed out of use until

Table 1 (Continued)

<u>Chemical Name</u>	<u>Rates of Exposure</u>	<u>Symptoms</u>	<u>Target Organs</u>	<u>Recommended Respirator Selection</u>
Benzene	Inhalation Skin absorption Ingestion Skin/eye contact	Irritated eyes, nose respiratory system; giddy; headache; nausea; staggering gait; fatigue; anorexia; lassitude; dermatitis; bone marrow depressant; abdominal pain	Blood, CNS, skin, bone marrow, eyes, respiratory system	Pressure demand SCBA with full face piece at any detectable concentration
Toluene	Inhalation Skin absorption Ingestion Skin/eye contact	Fatigue; weakness; confusion; euphoria; dizziness; headache; dilated pupils; lacrimation; nervousness; muscle fatigue; insomnia; paresthesia; dermatitis; photophobia	CNS, liver kidneys, skin	Full face chemical cartridge respirator with organic vapor cartridge up to 1,000 ppM.
Xylene	Inhalation Skin absorption Ingestion	Dizziness; excitement; drowsiness; incoordination; staggering gait; irritated eyes, nose, throat; corneal vacuolization; anorexia; nausea; vomiting; abdominal pain; dermatitis	CNS, eyes, gastrointestinal tract, blood, liver, kidneys, skin	Full face chemical cartridge respirator with organic vapor cartridge up to 1,000 ppM.
1,1,1-TCA	Inhalation Skin absorption Ingestion Skin/eye contact	Headache, lassitude, CNS depression, poor equilibrium, irritation to eyes, dermatitis, cardiac arrhythmias	Skin, CNS, cardiovascular system, eyes	Full face chemical cartridge respirator with organic vapor cartridge up to 1,000 ppM



minimal contact with contamination, along with the proper methods to decontaminate non-disposable equipment.

- \* Decontamination: The methods to don and doff protective equipment and clothing to ensure minimal contact with contamination, along with the proper methods, to decontaminate non-disposable equipment.
- \* Emergencies: Potential emergency situations, first aid, self-rescue techniques, emergency drills, Record keeping and investigation.
- \* BEII Procedures: All aspects of the BEII Health and Safety Program for Hazardous Waste Site Operations, site-specific HASP, the Corrective Action Plan, and company standard operating procedures regarding these areas:
  - \* Names of personnel and alternates responsible for site safety and health;
  - \* Known or suspected health and safety hazards;
  - \* Proper use of personal protective equipment;
  - \* Work Practices to minimize risks;
  - \* Safe use of engineering controls and equipment;
  - \* Medical surveillance requirements;
  - \* Site control measures;
  - \* Decontamination procedures.

## **7. MEDICAL SURVEILLANCE**

### **7.1 GENERAL**

A medical surveillance program has been instituted by BEII for all employees with potential exposure to hazardous substances. An initial medical examination is given upon initiation of employment, annually thereafter, and upon termination (if the employee has not had an examination within the last six months). In addition, baseline monitoring and job termination monitoring may be established to document exposure for project personnel. Subcontractors working with hazardous materials or in the site exclusion zones will be required to have their own company medical monitoring plan that meets BEII standards at a minimum.

### **7.2 EXAMINATIONS**

Each team member must have a physical examination prior to working on-site to verify that he/she is physically able to use protective equipment (including respirators), work in hot or cold environments and have no predispositions to occupationally-induced disease. The medical program will also consist of periodic follow-up exams and additional exams as needed to evaluate specific exposures of unexplainable illnesses. The exams will be provided by the San Bernardino Community Hospital or an equally qualified alternate who is Board-certified in Occupational Medicine.

## **8. PERSONAL PROTECTIVE EQUIPMENT**

This section details the level of personal protection to be used during field operations at the Angeles Chemical Company property. Appropriate levels of protection have been determined for areas on-site through the information detailed in the site hazard assessment.

### **8.1 GENERAL**

During all field operations, personnel shall wear hardhats, safety glasses, and steel toe safety boots. Any coveralls and work boots that are worn on-site should not be worn off-site.

## **8.2 LEVEL D OPERATIONS**

Level D operations will include equipment operators and all site personnel except those working in areas which have been designated as posing a possible exposure hazard. Level D personnel will wear work coveralls and Nitrile gloves, and have in their possession an air purifying respirator (half or full-face) with organic vapor cartridges.

## **8.3 LEVEL C OPERATIONS**

The use of Level C protection at the Angeles Chemical Company property is not anticipated. Previous air monitoring on-site has identified no significant concentrations of benzene vapors with a photoionization detector, which was identified in free product on groundwater at the site. Nevertheless, Level C protection shall be implemented in areas where task-specific air monitoring indicates that the action level of 1 ppm as benzene is reached. It is not anticipated that this level of air contamination will be present during remediation activities at the site. Level C protective clothing will consist of the general protective gear plus air purifying respirators with organic vapor cartridges. Dust filters may be worn over the respirators will be utilized by equipment operators while full-face respirators will be required of ground personnel. In addition, personnel will wear surgical inner gloves, Nitrile outer gloves, nuke booties and tyvek or saran-coated tyvek coveralls (depending on moisture or splash hazard).

An HI-NU DL-101 photoionization detector (PID) will be used on-site to monitor the air quality. The PID will be calibrated with isobutylene for the detection of benzene. The action level for the use of air purifying respirators will be set at 1 ppm as benzene. The action level will be inputted into the PID in alarm mode. The PID will be within ten-feet of on-site personnel. The PID will continuously monitor the air quality and sound an alarm when action levels are exceeded. To further protect site workers from possible exposure, a rigorous cartridge exchange program will be enforced. Respirator cartridges will be changed daily. However, should the action level be exceeded for a two-hour period then cartridges will be changed out every four-hours. Organic vapor/acid gas cartridges will be used in all respirators. All personnel undergo annual respiratory protection training in January of each year.

## **8.4 LEVEL B OPERATIONS**

The use of Level B protection at the Angeles Chemical Company property is not anticipated. However, Level B protection shall be used when benzene air monitoring concentrations exceed 5 ppm. Level B shall consist of all personnel protective equipment described above in Level C operations with the substitution of a pressure demand SCBA with full face piece.

The above levels of protection will be utilized during initial field operations. Upon receiving data from air, soil and water sampling, these levels of protection will be re-evaluated to provide sufficient employee protection while maximizing productivity. A situation may be present in which Level C respiratory protection is utilized while Level D clothing is used. Criteria for downgrading personnel protective equipment during field activities will be laboratory results indicating no potential for exposure above the Threshold Limit Value (TLV) for any site contaminant.

## **9. SITE CONTROL**

### **9.1 SITE SECURITY**

No one will be allowed to enter a site work area unless they have been given permission to do so by the Project Manager and the Site Safety Officer, and otherwise follow applicable portions of this HASP.

### **9.2 DECONTAMINATION PROCEDURES**

In order to assure that contamination is controlled and not spread from the site, decontamination procedures will be employed for both equipment and personnel. All decontamination activity will be monitored to assure compliance with the procedures described below.

Decontamination of personnel and equipment will be required following the monitoring activities. Decontamination procedures will be developed for both equipment and personnel. A distinction will be made between personnel equipment and monitoring equipment for purposes of decontamination.

#### **9.2.1 STANDARD DECONTAMINATION**

All field personnel exiting from the site must pass through a personnel contamination reduction corridor (CRC). At a minimum, all personnel exiting the site will remove all protective clothing and wash their face and hands before entering lunch and break areas to eat, drink or smoke. All personnel will perform a field wash (as defined below) before leaving the site.

A temporary CRC will be established by spreading a waterproof ground sheet and using several tubs for personnel decontamination. The area will be established by the SSO in discussion with the HSC and BEII Project Manager.

On-site showering will not be required as part of the routine decontamination procedure. However, a shower will be taken at the end of the working day after returning from the site to complete the decontamination process before the next meal or retiring for the day.

Disposal equipment, including respirator cartridges, must be placed in heavy plastic bags or directly into 55-gallon drums for off-site disposal in an approved manner. Used decontamination solutions will also be stored in 55-gallon drums.

#### **9.2.2 EMERGENCY DECONTAMINATION**

In the event that a seriously injured person is suspected of being contaminated, the SSO or other site worker will wrap the injured individual in clean plastic sheeting to prevent contamination of the ambulance. Less severely injured individuals will have their protective clothing carefully cut off before transport to the hospital.

#### **9.2.3 COVERALLS**

If coveralls are sent off-site for cleaning, the cleaner establishment will be notified of any hazards prior to receiving the coveralls.

#### **9.3 WATER AVAILABILITY**

Potable water will be available on-site. In addition, there are readily accessible toilet facilities on-site for personnel use.

#### **9.4 RECORD KEEPING**

To assure HASP implementation, many site activities will be documented. These include maintenance of the HASP at the site; employee HASP sign-off; daily safety briefings; site sign-in log; emergency medical data sheets; health and safety log-notes (which include instrument calibration records, sampling data, monitoring results and incident reports); chemical safety data sheets; and other records identified in the HASP. All documents noted are subject to audit and review by the Project Health and Safety Coordinator and/or Certified Industrial Hygienist.

#### **9.5 EMERGENCY RESPONSE PLAN**

Emergency response procedures have been developed for extraordinary events that could occur during field operations. These events include accidents and/or injuries, chemical exposure, spills and fires.

In general, the following actions shall be implemented in the event of an emergency:

1. First aid or other appropriate initial action will be administered by those closest to the accident/event.

**This assistance will be coordinated by the designated Site Safety Officer and will be conducted so that those rendering assistance are not placed in a situation of unacceptable risk. The primary concern is to avoid placing a greater number of personnel in jeopardy.**

2. The Project Manager, Field Supervisor and Health and Safety Coordinator will be notified immediately. They will in turn notify Angeles Chemical Company.
3. An Accident/Incident Report will be completed by the injured individual or witness and Site Supervisor. The Accident Report will then be forwarded to the Project Manager. Upon reviewing and commenting on the accident/incident, the form will be forwarded to the BEII Health and Safety Coordinator who in turn will investigate and make comments on the accident/incident. Any necessary changes to the operation will be made to prevent the same accident or near miss situation from occurring in the future.

### **9.5.1 ACCIDENTS AND INJURIES**

The following response procedures should not be considered inflexible. Every accident presents a unique hazard that must be dealt with by trained personnel working in a calm, controlled manner. In the event of an accident/unusual event, the prime consideration is to provide the appropriate initial response to assist those in jeopardy without placing additional personnel at unnecessary risk.

#### **9.5.1.1 ACCIDENT/INJURY IN CONTAMINATED AREA**

If a person working in a contaminated area is physically injured, American Red Cross first aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the person can be moved, they will be taken to the edge of the site (on a stretcher, if needed) where contaminated clothing will be removed (if possible), emergency first aid administered and transportation to a local emergency medical facility awaited.

#### **9.5.1.2 ACCIDENT/INJURY IN NON-CONTAMINATED AREA**

For accidents/injuries in a non-contaminated hazardous area, the procedures above should be followed with the exception that the injured individual should not be moved and the removal of contaminated clothing would not be necessary.

### **9.5.2 CHEMICAL EXPOSURE**

If the injury to the worker is chemical in nature (e.g., overexposure), the following first aid procedures are generally to be instituted as soon as possible.

#### **9.5.2.1 EYE EXPOSURE**

If contaminated solids or liquids get into the eyes, they will be washed immediately for 15 to 30 minutes at the emergency eyewash station using large amounts of water and lifting the lower and upper lids occasionally. Medical attention will be obtained immediately. (Use of contact lenses is not permitted in a designated Exclusion Zone).

#### **9.5.2.2 SKIN EXPOSURE**

If contaminated solid or liquid gets on the skin, the affected area will be promptly washed with soap or mild detergent and water. If contaminated solids or liquids penetrate through the clothing, clothing will be immediately removed and the skin washed with soap or mild detergent and water. Medical attention will be obtained if symptoms warrant.

#### **9.5.2.3 INHALATION**

If a person inhales a large volume of potentially toxic vapors, they will be moved to fresh air at once. If breathing has stopped, artificial respiration will be performed. The affected person will be kept warm and at rest. Medical attention

## **9.8 EMERGENCY EVACUATION PROCEDURES**

In the event of a site emergency, all workers at the site will be notified by the SSO or designee to stop work immediately and offer assistance. Those not needed for immediate assistance will decontaminate per normal procedures and leave the site.

## **9.9 GENERAL SAFE WORK PRACTICES**

### **9.9.1 MINIMIZATION OF CONTAMINATION**

Personnel and equipment used in the contaminated area should be minimized, consistent with effective site operations. Only absolutely required samples will be taken back to the laboratory. Contamination will be avoided wherever possible by not kneeling on contaminated ground, avoiding puddles where possible and using plastic drop cloths and equipment covers.

### **9.9.2 SAMPLING PROCEDURES**

Standard operating procedures will minimize the risk of personnel exposure to hazardous materials during sampling, packaging and shipping, and minimize the risk of exposure of others to spilled or residual waste materials.

### **9.9.3 SAFETY EQUIPMENT**

First aid kits and fire extinguishers will be available on-site whenever work is being performed. First aid kits will contain at a minimum the following equipment: large absorbent gauze, adhesive bandages, bandage compresses, gauze pads, eye dressing, scissors, tweezers, triangular bandages, antiseptic pads, first aid book, activated charcoal, syrup of ipecac, burn spray and roller badges. First aid kits will be portable.

### **9.9.4 FORBIDDEN ACTIVITIES**

- a. Eating drinking, chewing gum or tobacco, smoking or any practice that increases the probability of hand-to-mouth transfer and ingestion of materials in any area designated as contaminated;
- b. Ignition of flammable liquids or starting open flames;
- c. Wearing contact lenses on-site;
- d. Use of non-prescription controlled substances or alcohol on-site;
- e. Site work at night.

Appropriate signs will be posted at the site.

# Attachments

ANINS000214

## Field Team Review and Emergency Data

I have read and reviewed the most recent revision \_\_\_\_\_  
Date

of the Health and Safety Plan (HASP) for the \_\_\_\_\_  
Project

\_\_\_\_\_. I understand the information contained therein and will  
Site

comply with all aspects of the HASP.

Name: \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

This information is in case of emergency only:

Social Security #: \_\_\_\_\_

Person(s) to notify in case of Emergency:

Relationship: \_\_\_\_\_

Daytime Phone #: \_\_\_\_\_

Name of Physician: \_\_\_\_\_ Phone #: \_\_\_\_\_

Medical Coverage: \_\_\_\_\_

Employee Date of Birth: \_\_\_\_\_

\*Known Allergies: \_\_\_\_\_

\*Known Medical Conditions: \_\_\_\_\_

\*any known allergies or medical conditions that physicians should be made aware of before  
medical attention is given (i.e. allergic to penicillin).

## TAILGATE SAFETY MEETING

FACILITY

DATE                      TIME                      JOB #  
CLIENT                      ADDRESS  
SPECIFIC LOCATION  
TYPE OF WORK  
CHEMICALS USED

## SAFETY TOPICS PRESENTED

PROTECTIVE CLOTHING/EQUIPMENT

CHEMICAL HAZARDS

PHYSICAL HAZARDS

EMERGENCY PROCEDURES

HOSPITAL                      PH#                      PARAMEDIC# 911  
HOSPITAL ADDRESS (SEE ROUTE TO HOSPITAL MAP)  
SPECIAL EQUIPMENT

OTHER

## ATTENDEES

NAME                      CO./ORG.                      SIGNATURE

CONDUCTED BY:

BLAKELY ENVIRONMENTAL INV. INC. P.O. BOX 339 WRIGHTWOOD, CA 92397

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